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AUTHOR Aweiss, Salem
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ABSTRACT

This study investigated the kinds of knowledge and strategies beginning second-language readers used when reading texts to build their own consistent patterns of meaning and experience. Specifically, it looked at how readers' knowledge grew, where their ideas originated, and when and how their ideas were used. Subjects were five college students of Arabic, who were instructed in the think-aloud procedure and who then read four informative texts with varying text structures, styles, and subjects, thinking aloud as they read. Subject comments were categorized by reasoning operation and by monitoring concerns occurring during reading. Three additional analyses examined strategies used in meaning development, knowledge source used in making meaning, and timing of the comment in relation to the reading experience. Results indicate that subjects' primary concern during reading was with meanings they were developing, by using hypothesizing and schemata, formulating and refining ideas, focusing on specific content, and validating the text-model or text-world being developed. Behavior patterns differed somewhat at different points in the reading process, with more questioning and hypothesizing at the beginning and more knowledge use later. Behaviors generally focused on awareness rather than use. Meaning-construction strategies were consistent across texts. Contains 28 references. (MSE)

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VERBAL PROTOCOL DATA AS A RELIABLE SOURCE OF INFORMATION ABOUT READING BEHAVIOR AND COGNITIVE PROCESSES: THE CASE OF READING ARABIC AS A FOREIGN LANGUAGE (AFC)

BY SALEM AWEISS

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Verbal Protocol Data As A Reliable Source Of Information About Reading Behavior And Cognitive Processes: The Case Of Reading Arabic As A Foreign Language

Introduction

Reading is a cognitive activity, a process of meaning-in-motion in which understandings are developed and changed throughout the process, reflecting an interaction between the textual and extratextual factor at work in the process.

When readers develop their ideas, they rely on various kinds of knowledge: knowledge about the content, genre, and structure and how these work together in the evolution of the conceptualization of an entire unit of discourse (Iser, 1975; Langer, 1986; Langer, et al., 1990). This approach to the use of knowledge grows out of the constructivist view that language comprehension involves active participation on the part of the reader (Bartlett, 1932; Bransford & Johnson, 1973; Spiro, 1980) and that the meaning that develops is the consequence of a wide range of textual, contextual, and attitudinal forces continually at play in the human mind. This view of language comprehension has been adopted by many contemporary linguists (Fillmore, 1981; Halliday, 1977; van Dijk, 1977) and psychologists (Minsky, 1975; Shank & Abelson, 1977; Rumelhart & Ortony, 1977; Spiro, 1980).

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This approach to the use of knowledge is consonant with the proposition that meaning construction in reading is a function of the interrelationships among a variety of complex sources, and leads to the contention that "the act of meaning construction cannot be described by a linear, or even a simply recursive model--interpretation and change are deeply interwoven every step of the way" (Langer, 1986:74).

With respect to the construct of reading comprehension, it is known that direct assessment of the trait is impossible since it is a mental operation which is unobservable. Using think-aloud protocols is a way of getting at the unobservable behavior of reading comprehension.

Verbal Reports

The concept of introspection, that is, the manner in which the mind observes its own processes, can be traced at least to Aristotale and Plato (Boring, 1953). However, concurrent verbal reports, a popular tool of reading researchers, had their genesis in the experimental introspection of classical psychology.

The literature of cognitive psychology reports significant differences in opinion regarding the validity and reliability of verbal reprots. A think-aloud protocol is produced when a reader verbalizes his or her thought processes while completing a given task.

In a widely cited critique of the method, Nisbett and Wilson (1977) content that all verbal report data are highly suspect since, according to them, people have little or no access to their higher order cognitive processes.

Others believed that verbal reports might be appropriate under certain conditions. These researchers maintained that such data were useful in exploratory studies and as means of identifying hypotheses which could then be examined in subsequent research (Kanfer, 1968), or as one of several data bases providing convergent validity for a given research questions (Aweiss, 1993b; Sternberg, 1985). However, they cautioned against viewing verbal reports as substitutes for the events which they describe.

Still other researcher in the field (Afflerbach and Johnston, 1984; among others) share a perspective most cogently expressed by Ericsson and Simon who said that "verbal reports, elicited with care and interpreted with full understanding of the circumstances under which they were obtained, are a valuable and thoroughly reliable source of information about cognitive processes" (180:247). Specifically, Ericsson and Simon (1980) stressed the importance of minimizing: (a) the additional cognitive demands imposed by the directions to verbalize and (b) the amount of time between the utilization of a strategy and its report. When the two guidelines are implemented, it is less likely that the act of verbalizing will substantially alter

the subject's normal thought processes and more likely that the verbal reports will accurately reflect those processes. In short, the validity of the verbalizations will be enhanced.

Verbal reports or think-aloud protocols have been used in many L1 and L2 research studies as a method of getting at the mental processes that language learners use (Afflerbach & Johnston, 1985; Bereiter & Bird, 1985; Block, 1986; Cohen, 1987; Cohen & Hosenfeld, 1981; Ericson & Simon, 1984; Langer, 1986; Sarig, 1987; among others).

Despite having some reservation about the think aloud procedure--would slow down the reading process and provide an incomplete picture of strategy actitivty--Bereiter and Bird (1985) concluded that it is a useful technique, especially when the focus is the identification of strategies to teach. Likewise, after using the procedure in a reading experiment, Johnston and Afflerbach (1985:229) concluded that the think aloud procedure "elicited...largely veridical indications of the process".

In summary, studies that utilized introspective approaches were desinged to gain insight into various aspects of the reading process. While the results of these studies are not conclusive, they do suggest that under certain conditions, introspective approaches can be a viable means of studying the reading process.

The Study

The research investigated in this paper is part of a larger investigation that looked into the reading behavior and cognitive processes of foregin language learners.

Subjects: The participants for this study were beginning American learners of Arabic as a foreign language (AFL) enrolled at a large midwestern state university.

Materials: Materials for the study consisted of four short texts (150-175) informative texts adapted from the EMSA textbook (Peter Abboud & Ernest McCarus, Eds.). The passages are written in a variety of styles (text structures) about different subjects.

Procedure: The five subjects (2 males and 3 females) who voluntraily took part in the think aloud procedure were individually briefed and trained. The training session lasted between 13-30 minutes and included a sequence of direct explanations, coahing, and modeling. The subjects were instructed to "say out loud everything that comes to mind as you try to read and comprehend the text." The experimenter first provided an example and modeled thinking aloud. The subjects were then individually asked to think aloud about a short passage, and the experimenter provided feedback and in some cases more modeling. Subjects practiced thinking aloud on two more short passages. No additional practice was needed. During the actual experiment, The readers were not cued at predetermined points. Once they had received their

initial instruction encouraging them to express the processes tehy use while reading, they were not prompted to verbalize their thinking processes.

Analysis of Meaning Construction

The purpose of this analysis was to explore the kinds of knowledge and strategies readers used when contemplating written texts to build their own consistent patterns of meaning and experience. In particular, this analysis investigated how foreign language readers' knowledge grew, where their ideas originated, and when and how their ideas were used.

The on-line protocols gathered for the present study, provide the most direct look at such processes. By their very nature, such analyses enable the researcher to look through what readers say in order to describe the underlying patterns of foreign language readers' behavior.

To permit the codification and analysis of subjects' on-line attempts to construct meaning when they read, a detailed system, adapted from Langer's (1986) Analysis of Meaning Construction was used. The system describes the knowledge sources, specific strategies, and general approaches readers use to develop their interpretation of the text. Each comment was categorized along two major dimensions:on the reasoning operations, and on the monitoring concerns that occur during the reading activity. An additional three analyses examined

(1) the strategies used in meaning development, (2) the knowledge source used in making meaning, and (3) the time in the reading experience when that particular comment occurred.

The major categories examined in the Analysis of Meaning Construction are summarized in Figure 4).

Figure 4
Analysis Of Meaning Construction

Reasoning Operations
- Questioning
- Hypothesizing
- Assuming
- Using Schemata
- Making Metacomments
- Citing Evidence
- Validating

Monitoring
(awareness and use)
- Task goals
- Task Subgoals
- Genre/Discourse Structure
- Mechanics
- Lexicon
- Statements of Meaning
- Refinements of Meaning

Strategies
- Generating Ideas
- Formulating Ideas
- Revising
- Evaluating

Time
- Before
- During
- After

Knowledge Source
- Genre
- Content
- Text

The analyses were concerned with how readers make meaning, as this was revealed in their think-aloud comments about their behavior while reading.

Patterns of Reasoning Operations

One aspect of readers' strategic behavior investigated in this study, is the pattern of reasoning that is involved in meaning construction. During the process of independent reading, readers ask questions, make assumptions about what they and others know, use information or ideas drawn from their general schematic knowledge, generate hypotheses, give evidence for and seek validation of their ideas. The following is a sample of the thoughtful reasoning behaviors involved in the construction of meaning in the four experimental texts used in this study. The categories as well as the explanation that follow each of the reasoning operations were adapted from the original system of meaning construction developed by Langer (1986). The examples cited reflect comments made by the subjects in this study (Figure 5). Readers' communication units--remarks and comments--(193 in all) were transcribed and tabulated (by the researcher and an assistant) into 13 major categories and subcategories (see Figure 5).

Figure 5
Reasoning Operations in Reading

Questioning- uncertainties and incomplete ideas that the reader has at any point in reading--related to the genre, content, or text (no specified guess or expectation). "why is he telling the president about his teacher?" "What's it saying about the summer?"

Hypothesizing 1 Present- plans or expectations the reader makes about what information will be presented at that point in time."So, he is learning how to teach and he is writing to the president of U of Kuwait," "Perhaps this means taught, so he must have taught the Middle Eastern stuff."

(H) Hypothesizing 2 Future- plans the reader makes about what will be "said" in succeeding portions of the text. "I think he will go back to or travel to Jerusalem."

(H) Hypothesizing 3 Past - plans the reader makes about what might now be "said" or "understood" in preceding portions of the text. "May be it meant something like "speak, I speak."

(A) Assuming- meanings the reader assumes need no further explanations or elaborations. "Right, I thought it was about Egypt," "It doesn't seem to be an important thing,""There is nothing to think about."

(S) Using Schemata- the ideas being developed or explained based on genre, content, or text. "Oh, that's in upper Egypt," "that's similar to what we have in the states."

(SP) Using Schemata Personalized- personal experience drawn upon by the reader. "Ya, I've seen it, it's large," "I know that famous saying historically."

(SE) Using Schemata Evaluated- evaluations and judgments being made about what is being read. "It's the capital of Egypt, I know that," "He's visiting Jerusalem, that's pleasant."

(SL) Making Schematic Links- concept links being made by the reader. "He met me in the rain, that's strange. I thought it doesn't rain there in summer," "didn't he say he was Egyptian."

(MC) Making Metacomments Content- comments about the reader's use or non-use of particular content information. "that's not a clear letter," "Ah, there it is, I didn't read the whole sentence."

(MT) Making Metacomments Text- comment about the reader's use or non-use of particular surface features of the text itself. "This is difficult, I can't read it," "the English word is more difficult than the Arabic word."

(E) Citing Evidence- the information the reader presents, the explanations provided, or the evidence developed to answer a question or carry out a hypothesis. "he's looking for a job," "such an industrious student, this guy."

Validating- information (implied or direct) that the plan was fulfilled or a decision made. "Oh, Herodotus, that's the Greek guy," "I see, that's how it works there."

General Patterns

When foreign language learners read, the focus of their attention is almost equally divided between hypothesizing and using schemata, that together, make up more than half of their reasoning operations (Table 28). Other mental operations take place but in lesser frequency. Across the reading texts in the present study, 56 (29%) of readers' remarks (communication units) involved the direct use of hypothesizing--present hypothesizing accounting for 87% of their remarks within that category. 45 (23.6%) of subjects' comments involved using schemata. The remaining comments were split primarily among making metacomments 35 (18%), questioning 29 (15.2%). The reading protocols also showed less concern citing evidence in support of interpretations being formulated 6 (2.8%) and more with validating previous interpretations 22 (11.4 %).

Table 28
Reasoning Operations

	Number & % of Remarks/Comments (Communication Units)
Hypothesizing	56 (29%)
Using Schemata	45 (23.6%)
Metacomments	35 (18%)
Questioning	29 (15.2%)
Citing Evidence	06 (2.8%)
Validating	22 (11.4%)
Total	193 (100%)

Changes in Reasoning Over Time

Being both a dynamic and changing process, one would expect to find different patterns of behavior at different points during independent reading. In this analysis, the sequential coding of each comment in the protocols, permitted a closer look at how these processes change in the course of a single reading. Each protocol was divided into three segments:comments before the task began, comments during the reading activity, and comments after the last word was read.

BEFORE: Three of the five subjects who participated in the think aloud procedure in this study, began their reading tasks simply plunging in, without any preparatory hypothesizing about the passage, i.e., without any reasoning or mental operations. The other two subjects were more reflective, even before the reading task. Before reading, all four (3.7%) comments reflected hypothesizing about what the text would be about. No other reasoning operations were evident in the protocols.

DURING: Considerable consistency in the reasoning operations that occur from one segment to the next, with direct use of schemata and hypothesizing dominating. Questioning operations reflecting uncertainties and incomplete ideas that the reader has at any point in reading were also used more during the early stages of reading and became scarce toward the end.

AFTER: After they had completed reading a text, all subjects engaged in the mental activity of validating or reaffirming the accuracy of information in the text (75%). In addition, two subjects made comments reflecting their focus on their own experience (using schemata personalized).

Monitoring Behaviors in Reading

The process of reading involves a variety of self-regulatory mechanisms which monitor meaning construction. Langer (1986:83) argues that "monitoring behaviors serve as a "third eye" to see that meanings make sense and to flag

problems when messages become confused". Comprehension monitoring, employed by the readers in the process, serve a dual purpose. Firstly, when necessary, they help readers become aware of the cognitive activities involved in the process, and secondly, such mental activities help in the development, refinement, and organization of readers' ideas. It is thus safe to argue that the ability to monitor one's comprehension, the ability to detect comprehension breakdowns, and consequently utilize appropriate fix-up strategies, are important aspects of every reading experience.

Monitoring strategies were examined in terms of different concerns of the reader: These categories, with examples of their use, are illustrated in Figure 6.

Figure 6
Monitoring Behaviors in Reading

I- Awareness of Own approaches:

a) aware of task goals/demands."I'll read it again," "So, let's just review," It's the vocabulary that I basically need, I got the conjugation down."

b) Aware of subgoals: I don't know how to get to this word's meaning."

c) Aware of genre/discourse: "that's someone talking about the Nile," "now we go to the letter which is written in a month which I don't know," "peace be with you, that's a greeting. Let's see, this is a letter."

d) Aware of grammatical routines and mechanical features: "this must be the past tense of something," "So, that's whatever that called, tense, ah, it is called "passive," "I don't know what to do with this sentence."

e) Aware of available or unavailable lexical repertoire: "I didn't know what that word means," "it's a term like "while" or something," "I don't understand this, anyway."

f) aware of statements of meaning: I don't know what to do with this paragraph."

g) aware of refinements of meaning:"It's the capital of Egypt, I know that," "Ah, got that one," "ya, it's the Middle East, Jerusalem is in the Middle East."

II- Uses self-regulating mechanisms

a) formulates task/topic goals:"I'll try to translate this."

b) formulates subgoals:"ok, I'm confused. Let's go to some background information," "I don't know some words here, I'll look up the vocabulary."

c) uses genre/discourse features: No examples.

d) uses grammatical routines or mechanical features: No examples.

e) makes lexical choices: No examples.

f) states meaning:"he wants to visit Jerusalem," ""so he's decided to take the trip."

g) refines meaning:"oh, hold on, may be there are two dams," "I don't get it quite well, I"ll keep reading."

GENERAL PATTERNS

By the nature of the protocol data gathered, all of the comments recorded represent some degree of self-awareness or monitoring of what one is doing while reading. Generally speaking, foreign language readers' comments reflecting awareness of one or another idea or strategy exceeded those reflecting use by about sixfold (85% to 15%). In the former, the reader is more consciously aware of the choices available to choose among these alternatives in a strategic

way. In the latter, there is monitoring of what is being done.

Strategies Used in Reading

In the process of meaning development, foreign language readers, like all other readers, use a a variety of broad strategies. Strategies are deliberate, cognitive actions that can be accessed for a conscious report (Paris, Lipson, & Wixson, 1983). Most researchers argue that the strategies and the phases or stages of their use, are interrelated and recursive rather than representing a linear sequence (Flower & Hayes, 1980; Spiro, 1980). Four broad strategies were identified in the protocols of the present study (Figure 7)

Figure 7
Strategies Used in Reading

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1 (G) generating ideas--becoming aware of relevant ideas and experience.

2 (RF) Formulating and refining meaning--drawing on personal experience, linking concepts or propositions, and paraphrasing, and summarizing.

3 (EM) Evaluating meaning--reacting, and monitoring the development of meaning.

4 (RV) Revising--knowing meaning has broken down, and taking appropriate measures.

Remarks focusing on formulating meaning occurred most frequently (63%), followed by revising (22%), evaluating (10%), and generating (5%).

Knowledge Sources

Following Langer's (1986) system of meaning construction, three knowledge sources were identified (Figure 8): knowledge of genre, knowledge of the content or ideas themselves, and knowledge drawn from linguistic material of the text.

Figure 8
Knowledge Sources

(G) genre--reference to the specific genre and the organizational structure and presentation of ideas peculiar to that genre (5%).

(C) content--reference to the topic itself (75%).

(T) text--reference to the linguistic material contained in the text--syntax, vocabulary, cohesive ties from the text and reworded it (20%).

These sources simultaneously impact the reader's developing understanding. Genre expectations about both content and text, which are capable of shaping the reader's perception from the beginning of the reading, accounted for the least number of communication units or comments (5%). The greatest proportion of comments fell into the content category (75%), with the remaining (20%) reflecting concern with text.

Summary

The data presented in this analysis, supplemented by the qualitative analysis of readers' recall protocols, provide our most direct look at the processes underlying foreign language learner's reading performance.

In their reading, the primary concern of subjects was with the meanings they were developing. Across the various dimensions of the analysis, this emerged in their focus on hypothesizing, using schemata, formulating and refining ideas, focusing on specific content, and validating of the text-model or the text-world that was being developed.

In general, patterns of behavior were somewhat different at different points in the reading process--with more questioning and hypothesizing at the beginning, and more using of what they knew or were learning being reported at later points in time.

The general approaches of behaviors during meaning construction were were predominantly focused on awareness rather than use. In general, readers' comments focused on thoughts about awareness--about the options they might have available, rather than on what they were actually doing. Beginning foreign language readers were more likely to reflect forward or back on the ideas in the text as well as their own ideas than they were to simply provide running comments and remarks.

Though the particular emphasis varied from text to text, the strategies taken by individual readers in constructing meaning (their developing text-worlds or text models) were consistent across texts. Most comments reflected concern with formulating and refining meaning rather than generating ideas. Generating ideas, by definition, is a limited category

due to the nature of the reading task. The reader, unlike the writer, does not have to provide new material but rather focuses more on adapting the developing understandings to fit the author's message.

As they construct meanings, foreign language readers rely on a variety of strategies and approaches, most of which seem to be useful and used across a variety of specific texts.

The analysis of beginning foreign language readers' behaviors while reading leads to the conclusions that the behaviors are varied and complex and that they change slightly with text and topic.

The data reported in this section provide strong evidence that in reconstructing text meaning, even beginning foreign language readers employ reasoning and mental operations, monitor their comprehension, and draw upon different sources of knowledge. The reasoning operations and the strategies are of particular interest in that they may be the focus of instructional interventions. Readers may be trained in the different aspects of mental and reasoning operations as well as other prereading activities that may foster comprehension.

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